(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 598 564 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **93309059.9**

(51) Int. Cl.[5] : **B41J 2/17**

(22) Date of filing : **12.11.93**

(30) Priority : **19.11.92 US 978846**

(43) Date of publication of application :
25.05.94 Bulletin 94/21

(84) Designated Contracting States :
DE FR GB IT

(71) Applicant : **Hewlett-Packard Company**
3000 Hanover Street
Palo Alto, California 94304 (US)

(72) Inventor : **Lim, Chuin Kiat**
2 Melrose Drive,
Singapore 1335 (SG)
Inventor : **Chan, James Loke Kie**
Block 171,
Woodlands Street 11, 07-33
Singapore 2573 (SG)

(74) Representative : **Colgan, Stephen James et al**
CARPMAELS & RANSFORD
43 Bloomsbury Square
London WC1A 2RA (GB)

(54) System and method for drying ink on a printing medium.

(57) A system and method is provided for drying ink deposited onto an printing medium by a printer. The printer includes therewithin primary heat generating modules which generate excess heat within the printer when the ink is printed onto the printing medium, a thermally conductive platen over which the printing medium moves within the printer during the printing of the ink onto the printing medium, and heat conductive contacts. It also includes heat conductive contacts for conductively attaching the primary heat generating modules to the thermally conductive platen. The primary heat generating modules are conductively attached to the thermally conductive platen through heat conductive contacts. The primary heat generating modules generate excess heat for conductively heating the thermally conductive platen. Then, the printing medium is moved into contact with the heated thermally conductive platen thereby heating the printing medium. Next, the printing ink is deposited by the printer onto the heated printing medium. The ink on the heated printing medium is dried by effects of the elevated temperature imparted to the printing medium by the heated thermally conductive platen. In this way, faster printing throughput and improved print quality are provided.

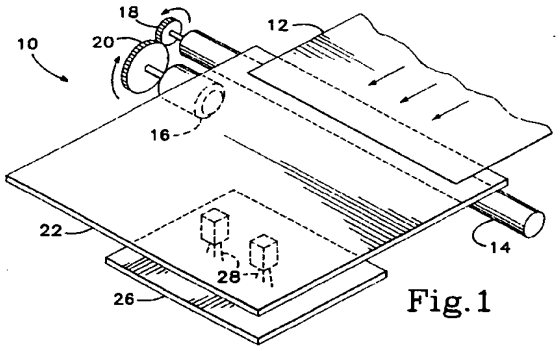

Fig.1

EP 0 598 564 A2

BACKGROUND OF THE INVENTION

This invention relates generally to the concept of drying ink applied to a printing medium by a printer during its printing operation, and more particularly to the drying of the ink without using the use of dedicated heaters for that purpose.

Prior art printer dry ink imprinted into a printing medium, usually paper, through the use of heaters. These heaters do nothing else but dry the ink.

Typical conventional methods of removing heat from a printer employ the use of dedicated heat sinks. For example, U.S. 4,982,207 to Tunmore et al. refers to a platen heater system for providing heat to a print sheet during its dwell time on the platen. The platen system comprises a heat foil for heat transfer between a power source and platen through a platen shell.

U.S. 5,046,420 to Sondergeld et al. describes a printer for tempering the operating temperature of printer elements by means including diversion of hot air generated by a printer to the elements to be tempered. It is stated that the printer avoids the potential need to heat application from an external source (col. 2, lines 19-26).

U.S. 3,074,332 to Robinson refers to a drying platen adapted for heat transfer relationships with a record. The platen is heated by "insert heaters."

U.S. 3,170,393 to Reinke describes a heat settable ink curable by brief engagement with a heated surface after imprinting.

U.S. 3,934,112 to Lakhani discloses a heater platen with electric heater elements for volatilizing a liquid toner carrier after imaging.

U.S. 4,751,528, U.S. 4,951,067 and U.S. 5,043,741, all to Spehrley, Jr., refer to heat-controlled platens for use in conjunction with hot melt ink.

SUMMARY OF THE INVENTION

This invention is directed to a system and method for drying ink on a printing medium during the printing process, and to a printer which employs such system and method. Instead of removing heat from a printer using a dedicated heat sink, as is done in prior art systems, the subject system has created a non-dedicated heat sink therewithin by conducting heat from a printer power supply to a thermally conductive platen for drying ink imprinted on paper in contact with the thermally conductive platen and thereby dissipating the heat from within the system.

Compared to conventional systems and printers, a number of advantages are offered by the system and printer of the present invention. First, the introduction into the system of this invention of a significant number of additional heaters to dry the ink on the printing medium thereby avoiding additional costs and additional space within the printer. For liquid-based printing processes, e.g., ink jet printing, the heated platen aids the ink drying process, allowing for faster printing throughput and improved print quality. Second, the introduction into the subject system of conventional dedicated heat sinks is not required again avoiding additional costs and additional space within the printer. This also allows for increased product density due to the space availability. Third, paper moving over the thermally conductive platen automatically helps to remove heat build up within the printer whenever it is used. The heat removal rate is automatically matched to the rate of heat generation in the system.

A system and method is provided for drying ink deposited onto an printing medium by a printer. The printer includes therewithin primary heat generating modules which generate excess heat within the printer when the ink is printed onto the printing medium, a thermally conductive platen over which the printing medium moves within the printer during the printing of the ink onto the printing medium, and heat conductive contacts. It also includes heat conductive contacts for conductively attaching the primary heat generating modules to the thermally conductive platen. Typically, the primary generating modules comprise a power supply or a motor.

The primary heat generating modules are conductively attached to the thermally conductive platen through heat conductive contacts. The heat conductive contacts preferably comprise metal clips and the thermally conductive platen is preferably made of a good metallic thermal conductor material. The primary heat generating modules generate excess heat for conductively heating the thermally conductive platen. Then, the printing medium is moved into contact with the heated thermally conductive platen thereby heating the printing medium. Next, the printing ink is deposited by the printer onto the heated printing medium. The ink on the heated printing medium is dried by effects of the elevated temperature imparted to the printing medium by the heated thermally conductive platen. In this way, faster printing throughput and improved print quality are provided.

More specifically, in the printer of the present invention, the thermally conductive platen acts as a non-dedicated heat sink. By employing this system and method, the excess heat generated is dissipated by moving the printing medium over the thermally conductive platen. The excess heat is conducted away from the thermally conductive platen through the movement of a corresponding amount of the moving printing medium, the moving printing medium improving air convection cooling over the thermally conductive platen.

As for the printer, it is typically a liquid-based printer, and preferably an ink jet printer.

The heat conductive contacts preferably comprise metal clips. Preferably, the thermally conduc-

tive platen includes means for drying the ink printed on the printing medium thereby providing for faster printing throughput and improved print quality. As for the printer, it is typically a liquid-based printer, preferably an ink jet printer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic perspective view of a system for removing excess heat from a printer for printing ink onto a printing medium.

FIG. 2 is a schematic side view of the system of the present invention.

FIG. 3 is a schematic end view of the system of the present invention.

FIG. 4 is an enlarged detailed view of a specific component being heat sinked by a thermally conductive platen.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. 1, a system "10" for drying printing ink deposited onto a printing medium 12, typically paper, by a printer (not shown). The printer is employed for printing ink onto a printing medium. The system 10 can be used in any printer. However, it is particularly useful in the GEM printer, a small portable printer manufactured by Hewlett-Packard Company.

The printing medium, which is typically paper 12, is moved through the printer by a rotating shaft 14 driven by an electric motor 16. The shaft and motor have respective intermeshing gears 18 and 20. Thus, gear 18 on shaft 14 is driven by gear 20 disposed on and driven by motor 16. Gear 18, and in turn shaft 14, are driven in a counter clockwise rotational direction by gear 20, which in turn is driven by motor 16 in a clockwise rotational direction.

As paper medium 12 is transferred through the printer it moves over a platen 22, typically a thermally conductive platen, during the printing of the ink on to the printing medium. The thermally conductive platen 22 is rectangular in shape and is typically constructed from a good thermal conductor, particularly a good metallic thermal conductor such as copper or the like. The thermally conductive platen 22 is heated as described below, and the heated platen is used to dry the printing ink on the paper 12.

As best shown in FIGS. 2-4, heat conductive metal clips 24 are attached to the underside of thermally conductive platen 22. The purpose of these clips is to hold the components which are to be heat sinked by thermally conductive platen 22 in heat conductive contact therewith. Thus, transistor 30, which generates excessive heat during use, is held in heat conducted contact by metal clips 24 to thermally conductive platen 22 (see FIG. 4) Transistor 30 is powered by a printed circuit board 26 and is electrically connected to board 26 by wires 28.

In use, the primary the heat generating modules, transistor 30 and power supply 26, respectively, are conductively attached to thermally conductive platen 22 through heat conducted contacts, i.e., metal clips 24. Heat is generated within the printer whenever it needs to print. As the printer is printing and generating heat, paper 12 feeds over the thermally conductive platen 22 which also acts as a heat sink drying the printing ink. Heat is conducted away from the platen through the thermally conductive platen 22 through the moving paper 12. At the same time, the moving paper 12 facilitates convection cooling of the thermally conductive platen 22.

When printing demands increases, more heat is generated within the printer, and more drying capacity is available. Also, more paper 12 will be fed over the thermally conductive platen 22 thereby causing the heat to be removed at a faster rate commensurate with the additional heat being generated.

Having illustrated and described the principles of my invention in a preferred embodiment thereof, it should be readily apparent to those skilled in the art that the invention can be modified in arrangement and detail without departing from such principles. I claim all modifications coming within the spirit and scope of the accompanying claims.

Claims

1. A method for drying ink deposited onto a printing medium (12), which comprises

providing a printer for depositing ink onto an printing medium (12), said printer including therewithin primary heat generating modules (26 & 30), a thermally conductive platen (22) (22), and heat conductive contacts (24);

conductively attaching the primary heat generating modules (26 & 30) to the thermally conductive platen (22);

generating excess heat from said primary heat generating modules (26 & 30) for conductively heating said thermally conductive platen (22);

moving printing medium (12) into contact with said heated thermally conductive platen (22) and thereby heating said printing medium (12);

depositing said ink onto said heated printing medium (12); and

drying the ink onto said heated printing medium (12) thereby providing for faster printing throughput and improved print quality;

the thermally conductive platen (22) acting as a heat sink and the excess heat being conducted away from the thermally conductive platen (22) through the movement of a corresponding amount of the moving printing medium (12),

the moving printing medium (12) improving air convection cooling over the thermally conductive platen (22).

2. The method of claim 1, wherein the primary heat generating modules (26 & 30) are attached to the thermally conductive platen (22) through heat conductive contacts (24).

3. The method of claim 2, wherein the heat conductive contacts (24) comprise metal clips.

4. The method of claim 1, wherein the ink comprises a liquid-based ink.

5. The method of claim 1, wherein the primary generating modules (26 & 30) comprise a power supply or a motor.

6. A printer for depositing printing ink onto an printing medium (12), which comprises

means for depositing printing ink onto an printing medium (12);

a thermally conductive platen (22) onto which the printing medium (12) is moved into contact during depositing of the ink onto the printing medium (12), said printing medium (12) being heated during contact with said thermally conductive platen (22) thereby drying said ink deposited onto the printing medium (12) and providing for faster printing throughput and improved print quality;

primary heat generating modules (26 & 30) which generates heat for conductively heating said thermally conductive platen (22); and

heat conductive contacts 24 for conductively attaching the primary heat generating modules (26 & 30) to the thermally conductive platen (22);

wherein any excess heat generated during said drying of said ink is dissipated by moving the printing medium (12) over the heated thermally conductive platen (22) which acts as a non-dedicated heat sink, the excess heat being conducted away from the thermally conductive platen (22) through the moving printing medium (12), the moving printing medium (12) improving air convection cooling over the thermally conductive platen (22).

7. The printer of claim 6, wherein the heat conductive contacts (24) comprise metal clips.

8. The printer of claim 6, wherein the thermally conductive platen (22) includes means for drying the ink printed on the printing medium (12) thereby providing for faster printing throughput and improved print quality.

9. The printer of claim 6, wherein the printer is a liquid-based printer.

10. The printer of claim 6, wherein the primary generating modules (26 & 30) comprise a power supply or a motor.

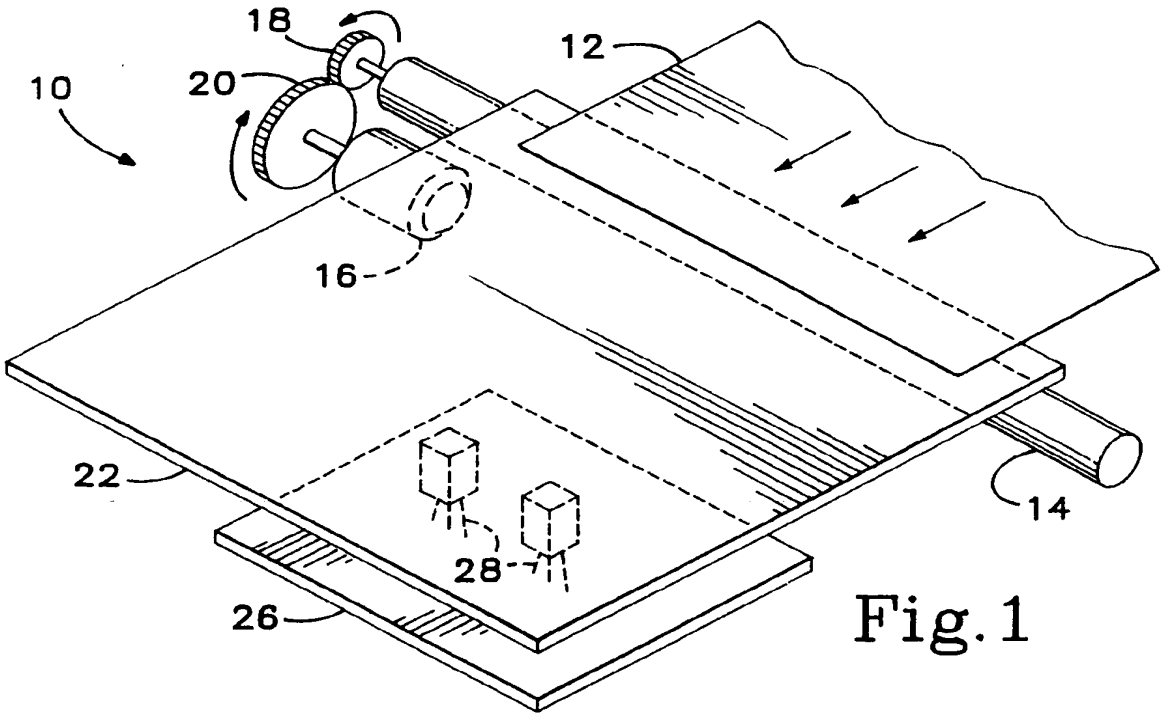

Fig. 1

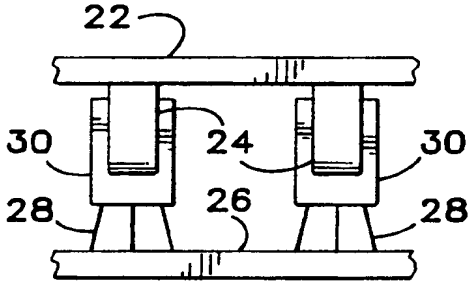

Fig. 2

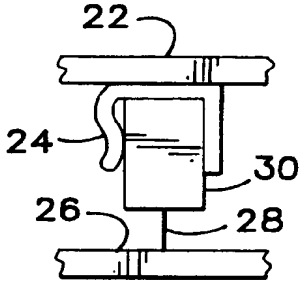

Fig. 3

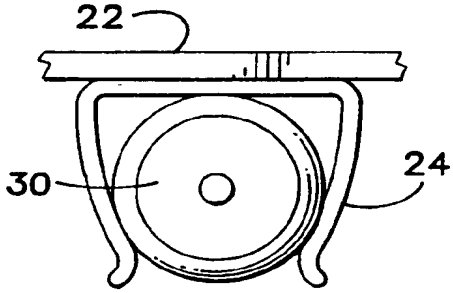

Fig. 4

BLANK PAGE

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 598 564 A3**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **93309059.9**

(51) Int. Cl.^{5} : **B41J 2/17**

(22) Date of filing : **12.11.93**

(30) Priority : **19.11.92 US 978846**

(43) Date of publication of application :
25.05.94 Bulletin 94/21

(84) Designated Contracting States :
DE FR GB IT

(88) Date of deferred publication of search report :
31.08.94 Bulletin 94/35

(71) Applicant : **Hewlett-Packard Company**
3000 Hanover Street
Palo Alto, California 94304 (US)

(72) Inventor : **Lim, Chuin Kiat**
2 Melrose Drive,
Singapore 1335 (SG)
Inventor : **Chan, James Loke Kie**
Block 171,
Woodlands Street 11, 07-33
Singapore 2573 (SG)

(74) Representative : **Colgan, Stephen James et al**
CARPMAELS & RANSFORD
43 Bloomsbury Square
London WC1A 2RA (GB)

(54) System and method for drying ink on a printing medium.

(57) A system and method is provided for drying ink deposited onto an printing medium (12) by a printer. The printer includes therewithin primary heat generating modules (126,30) which generate excess heat within the printer when the ink is printed onto the printing medium (12), a thermally conductive platen (22) over which the printing medium moves within the printer during the printing of the ink onto the printing medium (12), and heat conductive contacts (24). It also includes heat conductive contacts for conductively attaching the primary heat generating modules (26,30) to the thermally conductive platen (22). The primary heat generating modules are conductively attached to the thermally conductive platen through heat conductive contacts. The primary heat generating modules (26,30) generate excess heat for conductively heating the thermally conductive platen. Then, the printing medium is moved into contact with the heated thermally conductive platen (22) thereby heating the printing medium (12). Next, the printing ink is deposited by the printer onto the heated printing medium. The ink on the heated printing medium is dried by effects of the elevated temperature imparted to the printing medium (12) by the heated thermally conductive platen (22). In this way, faster printing throughput and improved print quality are provided.

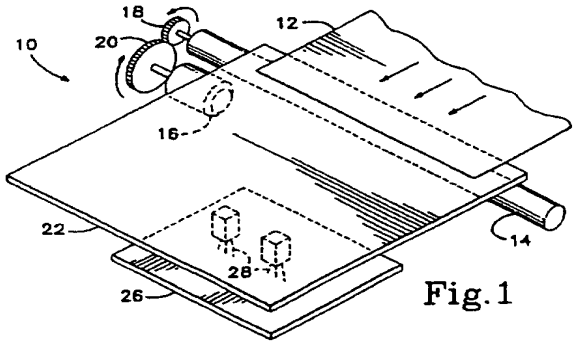

Fig.1

EP 0 598 564 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 9059

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-5 136 329 (YOSHINORI SUGIURA) * column 4, line 10 - column 5, line 5; figures 1-12 *	1,2,5,6, 8,10	B41J2/17
Y		4,9	
Y	US-A-5 021 805 (MAMORU IMAIZUMI) * claims 1-20 *	4,9	
A	XEROX DISCLOSURE JOURNAL, vol.7, no.6, November 1982 GILBERT M. ELCHINGER 'ELECTROSTATIC DRYER FOR INK JET PRINTERS'	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5) B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 July 1994	Henningsen, O

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)